

Remarks

Claims 1-25 are pending in the present application. Claims 1, 17 and 24 have been amended.

Applicants respectfully request reconsideration and withdrawal of the outstanding Office Action rejections based on the following arguments.

Response to Provisional Obviousness-type Double Patenting Rejections

Claims 1-3, 8, 11, 12, 14, 17-21 and 23-25 were provisionally rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 8, 13, 14 and 20 of copending Application No. 11/868,155 ('155) in view of U.S. Publication 2003/0005722 (Wilkinson). Claims 5, 7, 9 and 13 were provisionally rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 8, 13, 14 and 20 of copending Application No. 11/868,155 ('155) in view of U.S. Publication 2003/0005722 (Wilkinson) and further in view of U.S. 6,510,706 (Stone). Claim 4 and 22 were provisionally rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over the combination of claim 1 of copending Application No. 11/868,155 ('155) in view of U.S. Publication 2003/0005722 (Wilkinson) and further in view of U.S. Publication 2003/0005698 (Keller). Claim 6 was provisionally rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of the copending Application No. 11/868,155 ('155), U.S. Publication 2003/0005722 (Wilkinson) and in further in view of U.S. 6,564,579 (McCartney). Claims 10, 15 and 16 were

provisionally rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of the copending Application No. 11/868,155 ('155), U.S. Publication 2003/0005722 (Wilkinson) and in further in view of U.S. 5,114,451 (Rambo). Applicant respectfully requests that all provisional rejections on grounds of double patenting be held in abeyance until such claims have been indicated to be allowable and it becomes possible to determine whether claims directed to the same invention or an obvious variant thereof would be issued in more than one patent.

Response to Rejections under 35 U.S.C. §112

Claims 1-25 were rejected under 35 U.S.C. 112, second paragraph.

The Office Action contends that the claims are indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Particularly, the Office Action points out that the limitation "at least a major portion" from claims 1, 17 and 24 is indefinite because it does not clearly limit the scope of the invention.

In response to the rejection, independent claims 1, 17 and 24 have been amended to remove the language "at least a major portion" from the claims. Therefore, the rejection has been obviated by the amendments and claims 1-25 should be allowable under 35 U.S.C. 112, second paragraph.

Response to Rejections under 35 U.S.C. § 103

Claims 1-3, 8-12, 15-21, 24 and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Rambo (US 5,114,451), and further in view of Zahn (US 4,142,876). According to the Office Action, Rambo discloses a method, apparatus and system for recovery of liquefied natural gas liquids from liquefied natural gas comprising, receiving an input/direct stream (21) comprising rich liquefied natural gas. The Office Action acknowledges that Rambo does not indicate splitting/diverting the direct stream into a direct stream and a bypass stream. However, the Office Action contends that Zahn teaches a bypass and mixing of LNG lines where a portion of natural gas is diverted via valve (76) to line (18) where it is mixed with an overhead product stream (4) to produce gas stream (5). The Office Action asserts that it would

have been obvious to one having ordinary skill in the art at the time the invention was made to provide a bypass line for mixing as taught by Zahn in combination with the LNG plant disclosed by Rambo to provide means for system temperature control.

The Office Action further contends that Rambo discloses splitting the direct stream into primary (23) and secondary (26) feed columns where the feeds are subsequently heated in cross heat exchanger 41 and heat exchanger 12 to produce heated streams 24a and 27. The Office Action acknowledges that the streams are heated after the splitting in Rambo, however concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to arrange a single cross exchanger so as to heat a single stream prior to splitting the streams by utilizing the stream's cooling capacity.

The Office Action further argues that Rambo discloses: vaporizing the secondary column in a vaporizer; fractionating a top feed, the primary feed and the secondary feed in a fractionation unit to produce an overhead product stream and a bottom stream; condensing a portion of said overhead product stream by cooling the stream in the cross exchanger (42) to produce a condensed overhead product stream (54); pumping a reflux portion of the condensed overhead product stream to the fractionation unit as a top feed; and vaporizing the output stream where the output stream is compressed, then heated to produce a conditioned natural gas.

Applicant respectfully submits that one of ordinary skill in the art would not have been motivated to combine Rambo and Zahn for the following reasons.

The Supreme Court established the appropriate analysis and standards for analyzing obviousness: a patent shall be invalid if "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 550 U.S. at 416. "[A] court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions." *Id.* at 417. "[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007). There must be some reason to combine the prior art in the way embodied by the patent; some motivation or incentive is needed. *Id.*

The disparate nature of the cited references suggest that those of ordinary skill in the art of recovering liquefied petroleum gas or natural gas liquids from liquefied natural gas would not have been motivated to combine the cited references. This suggestion is buttressed by the fact that Rambo relates to a process for the recovery of natural gas liquids from **liquefied natural gas** while Zahn is directed to providing a method and apparatus for the separation of natural gas liquids from **natural gas**. Accordingly, there is a fundamental difference between the method and apparatus of Rambo and Zahn.

Liquefied natural gas (LNG) is natural gas that has been converted to liquid form for ease of storage and transport. Liquefied natural gas takes up about 1/600th the volume of natural gas in the gaseous state. The liquefaction process may involve removal of certain components, such as dust, acid gases, helium, water, and heavy hydrocarbons. The natural gas is condensed into a liquid by cooling it. An LNG handling and storage terminal is necessary to receive the compressed and/or cooled liquefied natural gas and revaporize it for use

Due to the different characteristics of LNG and natural gas, the process of converting them into natural liquid gas is different. When converting LNG into natural gas liquids, the stream of LNG enters an input at very low temperatures. The LNG input stream is then **heated** in a heat exchanger. Natural gas on the other hand must be cooled down. As disclosed by Zahn, the inlet gas is introduced into line 2 at an **ambient temperature** (column 3, lines 32-34). The plant inlet gas is passed by line 2 into a heat exchanger where its **temperature is dropped** (column 3, lines 36-39).

Further, the overhead product streams of LNG and natural gas are prepared using the opposite method. During the LNG process, a heat exchanger condenses the overhead product stream. The heat exchanger condenses the overhead product stream by **cooling** the overhead product stream. As disclosed in Rambo, the heat exchanger may cool the overhead product stream by rejecting heat from the overhead product stream to the direct stream (column 2, lines 12-15). The opposite process is disclosed with regards to the overhead product stream during the conversion of natural gas.

As disclosed in Zahn, once the gas in line 2 passes through the heat exchanger where the temperature is dropped, the now partially condensed gas is passed by line 3 to a separator. From the separator a **noncondensed** vaporous material flows through line 4 and the heat exchanger, where it is **warmed back up to ambient temperature** and leaves the system as residue gas (column 3, lines 39-45).

As disclosed above, due to the inherent differences between the process of converting natural gas and LNG to natural liquid gasses, Zahn teaches the opposite method and apparatus of Rambo. Therefore, there would be no reason to combine the prior art. Because there is no reason to combine the prior art in the way embodied by the patent, i.e., some motivation or incentive, the present claims are unobvious. See *KSR*, 550 U.S. 398, 418 (2007). To determine whether an invention is obvious, one must ask whether a practitioner of ordinary skill would have seen the benefit of the particular combination or modification which is claimed. *Id.* at 424 ("The proper question to have asked was whether a [practitioner] of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to [the invention].") Addressing motivation protects against the use of impermissible hindsight. *In re Kahn*, 441 F.3d at 986. Thus, a person of ordinary skill would find the disclosures of Zahn to be completely irrelevant to the claims of this application and not combinable with Rambo.

Further, the purpose of having the bypass pipe in Zahn is for a completely different reason than the present claims and therefore there would

be no motivation to use Zahn's bypass pipe in combination with Rambo. The Office Action contends that it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a bypass line for mixing as taught by Zahn in combination with the LNG plant disclosed by Rambo to provide a means for system temperature control. Zahn does in fact teach a bypass pipe to provide a means for system temperature control. However, the present disclosure is directed to a bypass pipe for completely different reasons.

According to Zahn, a controller manipulates a valve in the bypass pipe to reduce the flow of inlet gas by passing the nonprocessable gas directly to the residue gas. Reducing the volume of plant inlet gas flowing at ambient temperature into the heat exchanger directly reduces the temperature of the partially-condensed stream in line 3 (column 5, lines 4-7). In the present disclosure, the bypass pipe is used to divert some of the incoming liquefied natural gas around the gas conditioning unit, in order to exhibit relatively high ethane recovery or very low ethane recovery. Further, the diverted rich liquefied natural gas is mixed with recovered lean liquefied natural gas from the gas conditioning unit to provide a variety of blends of heating values. The present disclosure never makes reference to a temperature control of the LNG gas conditioning unit. Due to the differences in the use of the bypass pipe between the present disclosure and Zahn, in addition to the reasons stated above, there would be no motivation to use the bypass pipe from Zahn in combination with Rambo to come up with the present disclosure.

Further, the combination of Rambo and Zahn does not teach or suggest all of the elements of the independent claims. Although the Office Action contends that Zahn teaches bypass and mixing of LNG lines, the applicant respectfully disagrees. Zahn clearly discloses the inlet is natural gas and not LNG. Further, the natural gas bypass line 18 of Zahn is mixed with a noncondensed vaporous material that is warmed back up to ambient temperature. Zahn in no way discloses mixing of LNG lines.

Moreover, the combination of Rambo and Zahn does not disclose the claimed limitation of receiving an input stream comprising substantially rich liquefied natural gas and splitting the input stream into a direct stream and a bypass stream. According to the Office Action, Rambo discloses an input stream comprising substantially rich liquefied natural gas. The Office Action then contends that Zahn includes splitting an input stream into a direct stream and a bypass stream. However, Zahn discloses splitting natural gas, which would make the bypass stream in Zahn natural gas. Zahn does not disclose a bypass stream of liquefied natural gas, as stated in the claims. Therefore, a combination of Zahn and Rambo does not disclose the claimed limitation.

Further, the combination of Rambo and Zahn does not disclose the claim limitation of mixing the bypass stream with a balance portion of the condensed overhead product stream. This is because the input stream, the bypass stream and the overhead stream of the present disclosure are all different than the input stream, the bypass stream and the overhead stream of Zahn. For example, the condensed overhead product stream of the present disclosure is condensed by **cooling** in the cross-exchanger. This condensed

overhead product stream is then mixed with the **LNG** bypass stream. Zahn teaches an **uncondensed** overhead stream that is **warmed up** in the cross exchanger before it is mixed with the **natural gas**. Due to these discrepancies, the combination of Zahn and Rambo could not include a mixture of a LNG bypass stream with a condensed overhead product stream. Therefore, one having ordinary skill in the art could not combine Rambo and Zahn to produce all of the limitations in the independent claims.

In view of the foregoing, Applicant respectfully submits that the independent claims patentably define the present invention over the citations of record. Further, the dependent claims should also be allowable for the same reasons as their respective base claims and further due to the additional features that they recite. Applicant respectfully requests that the rejections be withdrawn.

Claims 5, 7 and 13 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rambo (US 5,114,451), Zahn (US 4,142, 876) and further in view of Stone (US 6,510,706). Regarding claim 5, the Office Action contends that Rambo discloses a method, apparatus and system for recovery of liquefied natural gas liquids from liquefied natural gas. The Office Action acknowledges that the reference does not indicate operating temperatures for the input stream. Accordingly, the Office Action contends that Stone teaches a process for recovering NGL where a direct stream is heated in a cross exchanger where the temperature of the stream is increased from -139F to -101.2F in the process of condensing an overhead product stream. The Office Action admits that the heated temperature does not fall precisely within the

range claimed by applicant, however maintains that it would have been obvious to one of ordinary skill in the art, at the time of applicant's invention, to operate a LNG recovery apparatus and method as disclosed by Rambo with the operating temperature as taught by Stone.

With regard to claims 7 and 13, the Office Action contends that Stone teaches a process for recovering LNG where an overhead product stream exits a fractionation tower with a temperature of -95.6F and the stream is subsequently cooled in a cross exchanger by heating a direct stream, forming a cooled stream with a temperature of -132.7F. The Office Action contends that it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to operate a LNG recovery apparatus and method as disclosed by Rambo in combination with the operating temperatures as taught by Stone to condense an overhead product stream and provide a cold reflux stream.

Applicant submits that the combination of Rambo, Zahn and Stone is deficient for at least the reasons described above with regard to independent claims 1, 17, and 24. As Stone does not and is not purported to remedy those deficiencies, Applicants submit that claims 5, 7 and 14, which depend from claim 1, are not rendered obvious by the combination of Rambo, Zahn and Stone. Thus, Applicants respectfully request that the rejection of claims 5, 7, and 14 be withdrawn for at least this reason.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rambo (US 5,114,451), Zahn (US 4,142, 876) and further in view of McCartney (US 6,564,579). According to the Office Action, Rambo discloses a

method, apparatus and system for recovery of liquefied natural gas liquids from liquefied natural gas. The Office Action acknowledges that the reference does not indicate operating temperatures. However, the Office Action contends that McCartney teaches the use of heat exchangers (26 and 30) for vaporizing LNG streams and heating said streams to a range between 30F and 50F. According to the Office Action, it would have been obvious to one of ordinary skill in the art, at the time of applicant's invention to replace the vaporizer as disclosed by Rambo with vaporizing heat exchanger as taught by McCartney to limit the amount of fluid flowing down the tower.

Applicant submits that the combination of Rambo, Zahn and McCartney is deficient for at least the reasons described above with regard to independent claims 1, 17, and 24. As McCartney does not and is not purported to remedy those deficiencies, Applicants submit that claim 6, which depends from claim 1, is not rendered obvious by the combination of Rambo, Zahn and McCartney. Thus, Applicants respectfully request that the rejection of claim 6 be withdrawn for at least this reason.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rambo (US 5,114,451), Zahn (US 4,142, 876) and further in view of Wilkinson (US 2003/0005722). According to the Office Action, Rambo discloses a method, apparatus and system for recovery of liquefied natural gas liquids from liquefied natural gas. The Office Action acknowledges that the reference does not indicate operating temperatures. However, the Office Action contends that Wilkinson teaches the liquid product stream (41) at the bottom of the fractionation tower as 115F. The Office Action contends that it

would have been obvious to one of ordinary skill in the art, at the time of applicant's invention, to operate a LNG recovery apparatus and method as disclosed in Rambo in combination with the operating temperatures as taught by Wilkinson.

Applicant submits that the combination of Rambo, Zahn and McCartney is deficient for at least the reasons described above with regard to independent claims 1, 17, and 24. As McCartney does not and is not purported to remedy those deficiencies, Applicants submit that claim 14, which depends from claim 1, is not rendered obvious by the combination of Rambo, Zahn and McCartney. Thus, Applicants respectfully request that the rejection of claim 14 be withdrawn for at least this reason.

Claims 4, 22 and 23 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rambo (US 5,114,451), Zahn (US 4,142, 876) and further in view of Keller (US 2003/0005698). With regards to claim 4, the Office Action contends that Rambo discloses a method, apparatus and system for recovery of liquefied natural gas liquids from liquefied natural gas. The Office Action acknowledges that the reference does not indicate temperatures for the input stream. Accordingly, the Office Action contends that Keller teaches a system for vaporizing liquefied natural gas where the system inlet temperature is -249F. The Office Action, maintains that it would have been obvious to one of ordinary skill in the art, at the time of applicant's invention, to operate a LNG recovery apparatus and method as disclosed by Rambo in combination with the operating temperature as taught by Keller.

With regard to claims 22, the Office Action contends that Keller teaches

a a submerged combustion vaporizer (SCV). The Office Action contends that it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to replace the reboiler disclosed in Rambo with a SCV reboiler as taught by Keller. With regards to claim 23, the Office Action contends that Rambo discloses a method, apparatus and system for recovery of liquefied natural gas liquids from liquefied natural gas. The Office Action acknowledges that the reference does not specify a heat source, however the Office Action submits that Keller teaches a submerged combustion reboiler that burns a portion of the LNG stream to vaporize the stream. The Office Action notes that it would have been obvious to one of ordinary skill in the art, at the time of application's invention, to replace the reboiler disclosed by Rambo with a submerged combustion vaporizer as taught by Keller, to vaporize a portion of LNG feed stream for reboiling.

Applicant submits that the combination of Rambo, Zahn and Keller is deficient for at least the reasons described above with regard to independent claims 1, 17, and 24. As Keller does not and is not purported to remedy those deficiencies, Applicants submit that claims 4, 22 and 23, which depend from claims 1 and 17, are not rendered obvious by the combination of Rambo, Zahn and Keller. Thus, Applicants respectfully request that the rejection of claims 4, 22 and 23 be withdrawn for at least this reason.

Conclusions

In view of the above remarks, Applicants believe that all of the Examiner's rejections set forth in the October 13, 2011 Office Action have been fully overcome. Applicants, therefore, believe that the application is in condition for allowance. An indication of allowability is respectfully requested and the Examiner is invited to telephone the undersigned if it is deemed to expedite allowance of the application.

The Director is authorized to charge any fees or overpayment to Deposit Account No. 02-2135.

Respectfully submitted,

By: /George R. Repper/

George R. Repper
Attorney for Applicants
Registration No. 31,414
ROTHWELL, FIGG, ERNST & MANBECK,
P.C.
Suite 800, 1425 K Street, N.W.
Washington, D.C. 20005
Telephone: (202) 783-6040